Choice or Consequence? Explaining Differences in Female Participation in Mathematics, Science and Technology in the Netherlands and Sweden

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CHAPTER 4

Are Swedish girls different? Understanding differences in students' choice processes towards natural science tracks in the Netherlands and Sweden

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Abstract

Sweden and the Netherlands are very similar in terms of economic development and gender equality. Yet, there is a striking difference in female participation in mathematics, science and technology (MST) studies. In Sweden female participation is two-and-a-half times higher than in the Netherlands. Assuming that insight in individual choice processes may reveal the reasons behind the different choice patterns, this qualitative study explores the way high school students in Sweden talk about choosing the Natural Science program, and compares this with what we already know about the way students in the Netherlands talk about the Nature and Technology-profile. We conclude that in both countries students' perceptions of natural science tracks are very similar, and do not explain the difference in gendered study choice patterns in MST fields in higher education, that later occurs in practice.

4.1 Introduction

Female participation in higher education has risen sharply in recent decades. In most EU and OECD countries more than half of all students in higher education are now female (Eurostat, 2012a). Yet, the share of women in mathematics, science and technology (MST) remains low (Eurostat, 2012b).[1] This lagging female participation in MST is a worldwide phenomenon of concern to many (Caprile et al., 2012; Marchetti and Raudma, 2010; Organisation for Economic Co-operation and Development, [OECD] 2006a).

To learn more about the underlying processes of the gender imbalance in MST, we conducted a case study on individual high school students' choice processes in the Netherlands (Yazilitas et al., 2016). That study revealed that being female has a significant negative effect on the choice for the so-called Nature and Technology (NT)-profile, i.e. the profile that gives the most comprehensive access to MST study fields in higher education. The study showed that female students differ considerably in the way they think about the choice for the NT-profile and MST fields and careers in comparison to male students. Additionally, the results revealed that gender differences cross-cut ethnic lines. While these results helped us to better explain the gender imbalance in MST in the Netherlands, they raised new questions as well, in particular about the influence of cultural factors on gender specific choice patterns.

When we look at the share of female students in MST across the EU and the OECD, we see a great variety of female participation in MST (Eurostat, 2012c, 2012d). Paradoxically, this also seems to apply to countries that appear similar in terms of gender roles and economic development. In order to better understand this puzzling variety in female participation in MST, even among countries with similar gender roles and socioeconomic progress, we decided to conduct a second case study in Sweden.

Sweden seems comparable to the Netherlands, with a similar low level of gender inequality[2] (United Nations, 2014a; World Economic Forum, 2014, 2015) and a similar high level of socio-economic development, for example in terms of GDP

per capita[3], in unemployment rate[4], in average life expectancy rate[5] and in overall human development[6] (OECD, 2015b; United Nations, 2014b, 2014c, 2014d). Yet, Sweden differs significantly from the Netherlands, with female participation in MST in higher education being two-and-a-half times higher than in the Netherlands. Recent figures from 2012 by Eurostat show that 15% of all female students is enrolled in MST, as opposed to 6% in the Netherlands (2016b).

In this second case study, we focus on understanding the difference in female participation in MST fields between the Netherlands and Sweden, by exploring the choice processes of individual students for natural science tracks in upper secondary education in Sweden, and on comparing these with the results found earlier in the Netherlands. The choice of countries takes advantages of substantial migration from non-Western countries (for a definition of this category, see the methodology section) to both the Netherlands and Sweden. As a result, students with a migrant background from these countries are currently making study choices in the Dutch and Swedish education system, which makes it possible to make both inter-institutional as well as intercultural comparisons (between students with a native Western versus non-Western migrant background) with regard to students' choice processes for natural science tracks in these two countries.[7]

In particular, we study how high school students in Sweden, with both a native and non-Western migrant background, talk about their so-called program choice at the end of year 9 (corresponding with age 15/16), and about the choice for or against the Natural Science, or NS-program. This choice is considered very similar to the profile choice students in the Netherlands have to make in upper secondary school, at which point they can opt for the Nature and Technology, or NT-profile. We focus our attention on the choice for the NS-program and the NT-profile because both tracks constitute a crucial step towards enrolment in MST fields in higher education in each country.

The research question we want to answer is: In what way do male and female students in Sweden talk about their

program choice and about the NS-program option, and if this is different from students in the Netherlands talking about their profile choice and the NT-profile, in what way is it different?

We will first discuss the theory underlying our study. Next, we discuss the design of the study and present the Dutch case study. This is followed by an explanation of our methodology for collecting and analysing data in the Swedish case study and a presentation of our findings in the Swedish case study. We then have a comparative discussion of our findings, which leads us to our conclusion.

4.2 Theoretical framework

The research literature on gender imbalances in MST provides various explanatory frameworks, at various levels of aggregation (for an overview, see Yazilitas et al., 2013).

Explanations at the micro-level refer to individual student characteristics. An example is the finding that girls' mathematics self-efficacy beliefs – that is, their confidence in their own mathematics abilities and skills – tends to be lower than boys', which would explain why they opt for MST less often (Bussey and Bandura, 1999; Lent et al., 1994).

Explanations at the institutional level relate gender differences in study choice to characteristics of the education system. For example, countries with highly differentiated education systems are found to produce more gender inequality than countries with less differentiated systems (Charles, 2011; Van Elk, Van der Steeg and Webbink, 2011; Wößmann, 2009).

Explanations at the macro-level focus on societal factors, such as dominant values and gender roles, which can explain different patterns in different societies. The relationship between social development, gendered identities and gendered choice patterns presents somewhat of a paradox, with female participation in MST fields actually being higher in societies with more traditional gender roles than in societies with more egalitarian gender roles (Charles and Bradley, 2009; Mendick, 2005a, 2005b). Here, Schreiner and Sjøberg (2004; Schreiner, 2006; Sjøberg and Schreiner, 2005), provide an insightful explanation for the paradoxical gender imbalances in study choice in

Western Countries based on Inglehart's modernization theory (1997; Inglehart and Norris, 2003; Inglehart and Wezel, 2005).[8] They argue that economic development and prosperity, in these countries, has led to an increased dominance of postmaterialist values As a result studies choices are more based on intrinsic motivation and on the connection of studies to students' core identities. Following this assumption, Schreiner and Sjøberg argue that both men and women in late modern societies, when offered a choice between different alternatives in higher education, will tend to choose studies which are more in line with their gender roles, which leads to a division in male and female fields of study. One would expect also that students with a non-Western background, whose families originate from economically less developed societies, have more positive attitudes towards natural science tracks than native Western students.[9]

As stated too in the earlier literature study, it is obvious, that each of these analytic frameworks helps to understand a piece of the puzzle of gendered study choice. However, it is also clear that focusing on each of these pieces separately may obfuscate the puzzle as a whole, which is essentially about how these pieces interlock in practice.

Given the vast scientific evidence available, it is now evident that individual, cultural and institutional factors all play a role in explaining gendered patterns of choice in MST, although currently very little is known about the way different factors work together in students' actual choices processes. To understand this, we are convinced, it is necessary to refocus research on gendered study choice on these actual choice processes and to explore qualitatively the interactions of the various factors in these processes.

In order to do so, we studied students of both sexes, coming from different cultural backgrounds, and in different institutional (national) settings.

4.3 The first study in the Netherlands

In our first study in the Netherlands, we focused on students' choices for or against the Nature and Technology-profile in preparatory scientific education or *Voorbereidend Wetenschappelijk*

Onderwijs, VWO (Yazilitas et al., 2016). At the end of year 8 (age 14/15), VWO students are required to choose one or more of the following four profiles: Nature and Technology (NT), Nature and Health (NH), Economics and Society (ES), and/or Culture and Society (CS). Of these, the NT-profile gives the most comprehensive access to MST fields in higher education. In the context of this profile choice, we focused on understanding the relationship between gender, ethnic background and study choice. This was done through mixed-methods research, in which we tried to establish not only the quantitative statistical relationship between these variables, but also tried to understand the study choice processes themselves and the rationales and motivations that students gave for their choices.

4.3.1 Place of the research and research period

The research in the Netherlands was carried out in two VWO schools with a mixed student population in terms of both gender and ethnic background. The two schools were located in a city that is known for its ethnically diverse population in the Northwest of the Netherlands.

4.3.2 Quantitative data collection and analysis

The quantitative part of the Dutch study focused on exploring the statistical relationships between profile choice (dependent variable), gender and ethnic background (independent variables). For this purpose, data were collected, on 259 students in grade 9 and grade 12, with help of the administration officers of both schools.

Following the *Centraal Bureau voor de Statistiek*, (CBS) [Statistics Netherlands] definitions, students were categorized as having a native Dutch, a Western migrant background or a non-Western migrant background. A non-Western migrant background meant that at least one of the student's parents was born in a non-Western country. Of the 259 students, 169 students (65%) were classified as having a native Dutch background, 57 students as having a non-Western migrant background (22%) and 34 students as having a Western migrant background (13%). As the profile choice was also likely to be influenced by

previous study results, the grade point averages for both natural sciences, in short Average Grade Sciences (AGS) - and languages, in short Average Grade Languages (AGL), on the report cards at the end of grade 9, were also included in the data.

4.3.3 Collection and analysis of qualitative data

The quantitative research was followed by qualitative research in the form of semi-structured interviews with students in grade 10 (age groups 14/15) and 12 (age group 17/18). Interviews were held with students in order to understand the actual choice processes students experience, when choosing for the NT-profile. The most important selection criterion was that students had to meet the entry requirements for the NT-profile, based on their grade point averages in grade 9. We did not decide the number of interviews beforehand and continued to do interviews until we reached the saturation point, where additional interviews did not provide new information (Glaser and Strauss, 1967). In total, 32 female students (64%) and 18 male students (36%) were interviewed. Of these, 33 students had a native Dutch background (66%), whereas 17 students had a non-Western migrant background (34%).

For the interviews, we followed a semi-structured scheme for which a topic list was put together based on the results of an earlier literature study (Yazilitas et al., 2013). The interviewer first shortly explained the research and her role as interviewer to the students. Students were then asked which profile they had chosen and why. This was followed by questions relating to students' self-efficacy beliefs, role models and opinions of significant others, such as their parents, siblings, peers, teacher and school mentors and their influence on their choice. Next, questions about the timing of the profile choice and interviewees expectations with respect to future fields of study and careers followed. When students did not talk about a NT profile or MST fields, interviewees were explicitly asked to share their thoughts about this profile and related fields and also why they did not opt for it.

The interviews were then transcribed, after which we read through the first couple of interviews and searched for themes related to the topic list and research question. Simultaneously,

open coding was performed when new themes emerged and we also wrote extensive memos in an effort to interpret the data more thoroughly (cf. Glaser and Strauss, 1967 and Erlandsson et al., 1993). The interviews were also encoded independently by two different authors in order to ensure that they were transparent and well-defined. The interviews were then read again in relation to each other. We then re-categorized codes and themes by creating new codes, themes and memos, when they appeared to overlap. These steps were repeated multiple times when adding new interviews to our analysis (cf. Glaser and Strauss, 1967 on 'constant comparison' and Corbin and Strauss, 2014 on 'axial coding'). After going through the first 15 interviews, the first overarching themes were compiled and discussed. Subsequently, we added more interviews in the analysis, and repeatedly went back to the last step, switching back and forth between the interviews, codes, memos and themes. After analysing the first 35 interviews in this way, three distinct patterns were visible. The interviews were not grouped by gender or ethnicity during our analysis. The groups that eventually emerged are therefore reflective of the patters that we found.

4.3.4 Results

Perhaps the most surprising insight we gained from the Dutch study was that, although girls much less often opt for MST fields in higher education, this does not show from their profile choice(s) at the end of year 8 (age 14/15) (Yazilitas et al., 2016).

Moreover, in our interviews we found that most of the girls, who chose the NT-profile, the native Dutch girls in particular, were hardly motivated for NT. These girls mainly choose NT because they were insecure about what they wanted in life and therefore tried to keep their options open. They mostly combined the NT-profile with the Nature and Health (NH)-profile, which felt nearer to their hearts. These girls (and some boys), which we labelled postmodern perfectionists, were in reality thinking about studying health and medicine related subjects in the future, but knew that studies like medicine also required physics and advanced mathematics. As for many of these fields, there are only a limited number of study places in the Netherlands; there was a

considerable probability of not getting in. Therefore, to improve their chances, these students not only tried to get the highest grades possible. They also regarded the NT-profile as a way to keep options open in case their preferred option would get blocked. Hence, these girls did not choose the NT-profile based on intrinsic motivation, but based on the institutional context provided by the Dutch education system, and out of fear of closing off options prematurely.

Our results further suggested that most male students who were capable of doing the NT-profile, native Dutch in particular, in general chose this profile because they thought they could manage this profile, because they thought it fitted their personalities, and because it allowed them to choose a study that would lead them to an interesting and well-paying job in the future. We labelled these students pragmatic hedonists because a study in the field of MST seemed to fit their personality and aptitude, and seemed an easy, straightforward path to a comfortable lifestyle.

Although, on the face of it, students with a non-Western migrant background seemed to make the same choices as their native peers, we found that their choices were driven by somewhat different values. Students with a migrant background typically had parents with little education, who held less prestigious jobs. These students opted for the NT-profile, because they wanted to make their parents proud as the NT-profile, particularly in combination with the NH-profile, had the highest status and granted them access to high status jobs and a high chance on material security. We labelled these students materialist maximalist because of their emphasis on these more extrinsic study motives of wealth and status.

4.4 The Swedish study

After the study in the Netherlands, Sweden was chosen as a second study, because the share of female enrolment in MST, when compared to the Netherlands, clearly defies the most important macro-level explanation for the gender imbalance in MST.

As indicated in the introduction, Sweden and the Netherlands are very similar in terms of economic development

and gender equality. Based on Schreiner and Sjøberg (2004; Schreiner, 2006; Sjøberg and Schreiner, 2005), one would expect to find similar gender differences in MST in countries with similar levels of socioeconomic development**.** However, in Sweden female participation in MST is two-and-a-half times higher than in the Netherlands. To understand why relatively more female students in Sweden opt for MST, we decided to compare male and female choice processes for natural science tracks in Sweden and the Netherlands, based on the assumption that students' choice for natural science tracks constitutes an important and crucial step in the trajectory towards MST in higher education.

Based on the existing literature and our earlier case study, we not only expected that male and female students differ in their choice process for natural science tracks, but also that female students in Sweden have more positive attitudes towards natural science tracks than female students in the Netherlands. In line with Schreiner and Sjøberg's explanation, we also expected, again, that students with a non-Western background have more positive attitudes towards natural science tracks than native Western students.

4.5 Object of the Swedish case study: the national program choice

To explore the relationship between gender, ethnic background and the choice for or against MST in Sweden, we decided to focus our study on the so-called national program choice in the Swedish upper secondary school system.[10]

Sweden has a single structure compulsory education system. Lower secondary education is part of the compulsory education, whereas gymnasium (*gymnasieskola*) is the general name for upper secondary high school in Sweden. Gymnasium corresponds with year 10 (age 16/17), year 11 (age 17/18) and year 12 (age 18/19) of the Swedish education system. There are 18 national programs or tracks that each last 3 years and that consist of upper secondary school foundation subjects, program specific subjects, orientations, program specialisations and a diploma project. At the end of year 9 (age 15/16), students who

want to continue with higher education, are required to choose 1 of 6 higher preparatory programs:

- Art, Music and Drama
- Humanities
- Business Management & Economics
- Social Science
- Natural Science
- Technology

According to Gy (2011), Natural Science, or the NS-program, is intended to lay the foundations for higher education studies primarily in the natural sciences, mathematics and technology. Students need to have a particular grade point average (GPA)-level at the end of primary school, in order to be able to choose the NS-program. The required GPA-level can vary between schools, since students compete for entrance based on their grades, although all programs require students to have passed Swedish, English and mathematics in the last year of primary school.

In this study, we decided to limit ourselves to exploring gender differences in students' choice processes towards the NS-program, because this program provides the most direct and the most comprehensive access to MST in higher education and thus constitutes a first crucial step towards MST. The Swedish case study was also methodologically limited in comparison to the Dutch case study. In Sweden we applied a qualitative approach to study students' choice processes instead of using a mixed-method approach because of administrative inaccessibility of students' grade point averages in primary school.

4.5.1 Place of the research and research period

The research was conducted in two gymnasium schools with a student population that was mixed in gender and ethnicity, in a medium sized city in the South of Sweden. The city in question has been anonymized for the protection of students' privacy. The data collection took place in the period January to March 2014.

4.5.2 Data collection and data analysis

Qualitative data were gathered through semi-structured interviews with male and female students with both a native Swedish and non-Western migrant background in year 10 (age 16/17), 11 (age 17/18) and 12 (18/19).[11] We interviewed high schools students in upper secondary level and asked them to explain how their actual program choice had come about. The main criterion for selecting students was that students had to be able to choose the NS-program based on their entry level. Interviews were held in English after several pilot-interviews to ensure that students had a proper command of English to express their thoughts. In total, 36 interviews were held (see table 1 for an anonymized list of interviewees). We tried to balance the number of male and female students as much as possible. However, the number of interviews was not decided beforehand and the main researcher continued to do interviews until the saturation point was reached where additional interviews did not provide new information or insights (Glaser and Strauss, 1967).

Interviews followed the same semi-structured scheme that was applied in the Netherlands. The interviews were first transcribed and analysed according to the same procedure that was applied in the Dutch case study.

4.6 Results in Sweden

After analysis of the interviews we were able to distinguish three main ideal types of students, which we labelled: the postmaterial idealist, the postmaterial maximalist and the material maximalist. Since each category is an abstraction and simplification of reality, not all students fitted fully in one single category.[12] None of the students fell outside the three ideal types, but some students shared features that combined two ideal types. In such cases we had to decide which one they most closely matched (see table 1 for an anonymized list of interviewees).

Table 1. List over interviewees

	Name	Sex	Ethnic background	Program	Future orientation	Type
1	Agnes	f	Western	natural science	doctor, pilot, lawyer	1
2	Alexander	m	native	natural science	tech start-up	2
3	Amina	f	non-Western	art, music & drama	photography	1
4	Anna	f	native	art, music & drama	musician	1
5	Asif	m	non-Western	natural science	doesn't know, biology	2
6	Cecilia	f	native	natural science	plastic surgeon	1
7	Elsa	f	Western	natural science	medicine, surgeon	3
8	Erik	m	native	natural science	pilot, doctor	2
9	Erika	f	native	natural science	publisher	1
10	Farzaneh	f	non-Western	natural science	medicine	3
11	Filippa	f	native	business management & economics	advertisement business, project manager	2
12	Freja	f	native	natural science	medicine, doctor, brain surgeon	1
13	Ines	f	native	social science	international relations	1
14	Irfan	m	non-Western	natural science	medicine	3
15	Isabella	f	Western	business management & economics	human right lawyer, diplomat	1
16	Josefin	f	Western	natural science	neurosurgeon	1
17	Lene	f	native	business management & economics	architect, interior designer	1
18	Maria	f	Western	art, music & drama	medicine, nursing	1
19	Mark	m	native	business management & economics	law, lawyer	3
20	Maryam	f	non-Western	natural science	doesn't know	3
21	Matteo	m	native	natural science	business leader	2
22	Mazar	m	non-Western	natural science	tech start-up	2
23	Mustafa	m	Western	social science	realtor	3
24	Naima	f	non-Western	natural science	dentist	3
25	Najla	f	non-Western	natural science	dentist, pilot	3
26	Nils	m	native	art, music & drama	film director	2
27	Nur	f	non-Western	natural science	civil economist	3
28	Oliver	m	native	art, music & drama	3D animator	2
29	Peter	m	native	natural science	chemistry, biology	2
30	Rania	f	non-Western	natural science	nurse	3

31	Samira	f	Western	humanities	doesn't know	1
32	Sebastian	m	native	natural science	marine biology	1
33	Stella	f	native	business management & economics	marketing, HRM	2
34	Stine	f	native	humanities	philosophy	1
35	Ulrike	f	native	business management & economics	lawyer, politician, business manager	2
36	Yaseen	m	non-Western	natural science	doesn't know	3

4.6.1 Postmodern idealist

The postmodern idealist is typically a native female student who will try to choose a program that enables her to have a meaningful and fulfilling career in the future. In search of this, the postmodern idealist will favour study fields and careers that match her 'unique' personality and that have a strong social dimension, such as helping others and working with other people.

Helping others

The way in which some of these elements come together, is exemplified in the following quote by Freja, a prototypical postmodern idealist. Asked if she ever considered other study fields than medicine, Freja answers:

> 'When I was younger, I wanted to become, like work with theatre, in musicals, as a musical artist, kind of, because I went to the theatre when I was younger and I really liked to sing and dance. So, I think, maybe from 5th grade to 8th grade, that's what I wanted to become. Then I like realized, well maybe not. Like my whole life, I can still sing and dance like at home, and I can take theatre courses if I want to. I don't have to live like that. [...] I think that I've always wanted to help people, because I really want to do like volunteer work in some poor country, like

> Africa or something, I think that that is what I always have wanted to do, like even maybe in 6th grade, but I don't know if I wanted to become a doctor, but I would have wanted to volunteer in some way, so like help people'.

The quote discloses how future-conscious Freja is in relation to her choice to pursue a career in medicine. Freja also believes that she would make a good doctor because she has 'always wanted to help people'. She also believes she has the right 'social skills' to be a good doctor, including 'interact well with people'.

Likewise, Josefin explains her motivation to work as a brain surgeon thus:

> 'Because I like to meet people. I like to work with people. I like to help. I want to go someplace else, when I have got my education, to work as a doctor without borders. Yes, something like that and I am really interested in the brain. And I am very like, I like to work with small things and stuff. So I think it would be really interesting and nice to help people and learn a lot'.

Having fun

It is also important for a postmodern idealist to have fun, besides doing work that has a strong social component. Agnes, who is interested in becoming a pilot or a doctor, says:

> 'You can't do something that's really boring. […] Because you would be so unhappy. […] I know that I couldn't like work something my entire life, and just like knowing that I don't want to do that'.

However, fun is not particularly associated with MST careers or study fields. Agnes, for example, mentions a movie they were shown in school: 'Like the one scientist, he was like: 'I like to work in dark spaces, when I'm all alone.' For Agnes, working as a scientist means that you have 'no social' life, and that does

not appeal to her as fun. Similarly, she refers to working as a chemist and says:

> ‘I don’t think I would ever be good as a chemist, because I don’t know if I’m that patient and all of that, like study all the time’.

There are, however, also students who do not have particular negative associations related to science, technology or working as a scientist. Freja is one of those students, as she says that she is interested in working as a researcher, e.g. in the field of neuro-psychology, researching epilepsy, for example. However, for Freja, this interest is ‘always related to hospitals and helping people’. On research outside health-related fields, she says:

> ‘I think it’s cool, but it’s not like my burning interest in life’.

Creating opportunities

Besides helping others and developing oneself, having a wide range of future career options is also important for postmodern idealists, in making their program choice. Josefin, for example, says that she chose the NS-program because of its broad scope in terms of future career perspectives:

> ‘Because it’s a very wide program. You can be a doctor, you can become a scientist, you can become a journalist, you can become pretty much everything’.

Erika, who is interested in becoming a veterinarian, similarly emphasizes this element in her own choice for the NS-program:

> ‘I chose this program because, it was the widest, so I can become anything because I wasn’t certain about what I wanted to do’.

This also applies to Agnes, who explains why she chose the NS-program:

> ‘I chose this program because you get the most variation of choices and you can be a lot of things. It’s the most difficult program, but it’s still the best I think’.

Significant others

Another important characteristic of postmodern idealists is their sensitivity to what others think of their choices. These others include predominantly family members. Freja, for example, explains that her family has had a major influence on her career orientations, as she is informed by various relatives how it is to be working in a hospital:

> ‘A lot of people in my surrounding, like my family, like my mom, has worked in hospitals, and also my grandma, and my dad’s new girlfriend also works like now in a hospital with the brain. So, I think that maybe influenced me’.

Josefin also talks about her teachers, who had rather seen her choose the Art, Music and Drama program, instead of the NS-program, because it fitted better with Josefin’s primary school’s focus on arts and music education. Yet, she chose the NS-program because:

> ‘My parents have always been like: “no, you have to go Natural Science”. I mean, you will get so much more out of it. So I chose that’.

Josefin adds that her father studied natural science and is now an engineer, while her mother tried to study it but quit because ‘it was ‘too hard for her’. Her mother, however, ‘really regrets quitting’ and told Josefin ‘no, you have to go to Natural Science, you have to do it’. For some time, Josefin also considered pursuing a career as a ‘space scientist’ but eventually

changed her mind about this, because she doesn't associate that type of work with being social.

While postmodern idealists believe that their choices are reflective of their individual personality, these are obviously also informed by what others expect of them and social norms. The importance of choosing an education and career that correspond with their personality, and that also provide ample opportunities to develop themselves, as well as help others, leads postmodern idealists to prefer programs that lead to careers that have a strong social component, such as a doctor.

4.6.2 Postmodern maximalist

The postmodern maximalist is typically a male student with a native background who will try to choose a program that matches his personal interests and that gives him access to fields and careers he feels are fun and that he can be successful at in the future. Success, for the postmodern maximalist, can have different forms, but certainly includes elements of personal achievement and being recognized by others. At the same time, postmodern maximalists, compared to the postmodern idealists, seem more undecided about their future in terms of study fields and careers. The postmodern maximalist is also influenced by others in his choice-making process. These significant others include mostly successful family members, entrepreneurs, popular culture or otherwise famous people.

Early interest

Alexander, a typical example of a postmodern maximalist, says that he has always been interested in technology:

> 'Ever since I was a little kid, like 1-2 years old, I've always been interested in technology. I've always wanted to be the one opening the doors, […] answer the phone, look at all the technology, computers, mobile phones and so on. And so, it's always been a part of me. And, I'm the most interested in technology in my family. I'm the one who has to do all this technical stuff. In that way my interest of technology

grew and grew, so that's kind of always been like that'.

This also applies to Peter, who similarly links interest in natural sciences to his early childhood:

> 'That goes a long way back. Like when I was a kid, I was kind of a dinosaur-expert. That sort of fascination about nature. And eventually it grew beyond dinosaurs, it grew very gradually, like I was also very curious as a kid. […] Natural science was almost always fun, interesting and fun, I thought. And it was such a wide field, it could be anything from how planets move in the solar system and how the universe works down to how microscopic life works and stuff, like that, and everything in between. So it was very fascinating and I still think that'.

For Sebastian, the choice for the NS-program also came very natural since he has 'always' been interested in working on climate change. He says that for him it was clear 'from the very beginning' that he would choose this program, ever since he was a little child.

Drive towards success

Matteo emphasizes the importance of having a job you can be successful at but is also personally fulfilling. He isn't interested in a MST career, because he doesn't 'want to be working with a computer'. He prefers 'to work with people', because he sees it as a prerequisite for being a good 'leader' and to be 'recognized' by others:

> 'I don't know why, but I feel I was born a leader, and I want to give expression to that. And you know, I want people to recognize me when I will be passed away, basically. So I want to give something back to society. And that's why I'm going to have a business or being a doctor or something'.

Peter considered a future in music, but instead decided to continue with natural sciences, because, he says:

> ‘The thing with music is, it either, I thought, it goes very well or it doesn’t go good at all. Like when you play music and you become famous, you’re very successful and for example, make millions of dollars every day but if you don’t become successful, it is very hard to make a living on music’.

Alexander, who dreams of being a CEO of a small tech-company, similarly stresses the importance of both success and interest:

> ‘I have had this dream of having a pretty small company, you know, like with 10 employees or something. Developing a new product, maybe software and having a small office. […] It’s challenging. Always new things. You have to always develop your software in order to keep the customer satisfied. It is very exciting’.

The same type of ambition is reflected in Mazar’s remark:

> ‘I would really love to create a company of my own. Run my own business. Maybe create an app, application, on the smartphone’.

Undecided about the future

Most postmodern maximalists however, in spite of their strong desire for success and doing something interesting, seem quite undecided about the future. Alexander, for example, whilst ‘dreaming of being CEO’, also says:

> ‘I don’t exactly know what I’m going to do in my life or where, when, exactly’.

This also applies to Mazar, who despite his ambition to have his own company, has no clear idea about what to do next:

‘I don’t really have a clear idea of what I will do after these 3 years’.

This undecidedness about the future is also reflected in Asif and Peter’s stories. When we ask Peter about the latter, he replies that he ‘hasn’t given it that much thought actually.’ Similarly Asif says:

‘I really don’t think about the future right now. I think like, my future is what I do right now’.

Creating opportunities

Besides having fun and achieving success, having a wide range of future career options is also important for postmodern maximalists in choosing their program. Matteo, for example, explains that the choice for the NS-program was easily made because it enabled him to pursue and combine different career interests:

‘I could either be a doctor, a lawyer or an entrepreneur, leader for a big company. And that is why I wanted Natural Science and entrepreneurship’.

Later, however, Matteo explains that his preferred field of study is actually economics, but that he chose the NS-program to give himself ‘more opportunities’. The same reasoning can be found in Alexander’s story. Alexander, who is ‘very interested in computers, new technology, cell phones, programming and web-design’, says:

‘I think the best way was to go the science program. That’s the widest program of them all, because if you maybe want to study economics, after the gymnasium, you can also do that if you’ve studied the science program. But if you maybe want to study science after having chosen the economics program, it’s much harder. So basically the science program is much wider and it makes the choice so much easier when you’re finished’.

Erik similarly says that he chose the NS-program because:

> 'I want to have like all of the opportunities available when I finish'.

Significant others

Postmodern maximalists, like postmodern idealists, are also prone to influences from others in their choice making process. These others are mostly successful family members, entrepreneurs, otherwise famous people and popular media.

Matteo, for example, relates his choice for the NS-program and not Business, Management & Economics, to his father. Matteo's father, who works as a business 'leader' himself, advised his son against the economics program because of the decreased demand on the labour market for economists and the increased demand for people with a natural science education. Matteo acknowledges this by referring to 'popular media, including television and magazines' but also other people around him' and concludes:

> 'They really want engineers and doctors at the moment'.

Sebastian is also influenced by his family members in his orientation towards a career as a marine biologist, in particular by his older sister:

> 'She goes to companies and she works with them and sees whether they [keep to environmental regulations] and stuff, and she also works at the marine centre as a science boss'.

Likewise, Alexander refers to his successful uncle as his main role model:

> 'My uncle has a pretty dream job. He is CEO of a small company with around 10 employees. […] They have like X in Sweden as their client. Now they also

get customers from America. So he travels a lot to there and that is pretty a dream job for me.'

In a similar vein Mazar refers to successful Swedish tech-companies as a source of inspiration for wanting to have his own company in this area:

'Many Swedes have actually been very successful in this part, you know, like Spotify, you know, Skype. Both of them are Swedish, and then we have games from Sweden, a lot of those indie games styles. Small business companies that create one thing and then they get big'.

For the postmodern maximalist the importance of choosing an education and career that fit with their personal interests and also provide ample opportunities for a successful life, leads them to adopt a broad program strategy that enables them to pursue and combine different career interests at the same time, while they figure out what their next step is going to be.

4.6.3 Modern maximalist

The modern maximalist is typically a student with a migrant background, who will try to choose a program that leads to careers that provide economic security and stability, and are high in income. Modern maximalists typically are also more worried about the future. Their concerns relate mostly to unemployment, racism, increased competition on the labour market and not having enough financial resources. In pursuit of a comfortable and carefree life, both in financial and social terms, modern maximalists will favour programs and study fields that limit the risks of unemployment and financial dependence. Family, primarily parents and older siblings, are often very actively involved in modern maximalists' program choice-making processes.

Thinking ahead and being serious

In thinking about the choice for a future study-field and career, Farzaneh, who wants to become a doctor, systematically

emphasizes the importance of thinking ahead about your future and not only about fun. Asked what Farzaneh would give as an advice to someone who has to make a program choice, she stresses the great importance of 'making a career':

> 'I would say, first of all, I would say interest is like the biggest part in it. I would ask the person what their interests are, what they think is fun for them to do. But it's not all about the fun, though. It's about making a career of it as well. I mean, yeah, this is going to sound really mean, but I don't judge people who like go to dance school, because you can definitely become something in that, but I mean, if you say I want to become like an actor, the chances are small, you can totally go for it, but you have to also think about, yeah, where will I get my income from, where will I live from, like I mean, it's not just about these 3 years, it's about everything after that'.

For Farzaneh 'making a career' is therefore about calculating the risk of failure against the likelihood of success on the long term, as well as securing an income.

Naima, who wants to be a dentist, similarly stresses that school is not about having fun and that one needs to be prudent about the future:

> 'You can't always have fun, sometimes you need to be serious. Because it's like I, in my age, if I only think of having fun, then like in the next 10 years, then I won't be happy, you know, it is only 3 years in the high school. […]. Because if I go out a lot, you know, I won't do my homework and stuff, so I will just have fun those 3 years, then after high school, I'll have nothing. I'll have nothing to work on'.

Safety-blankets

This idea of thinking ahead also resonates in the fact that Farzaneh sees being a doctor as a 'safety-blanket', because it

enables her to work everywhere, anytime and secure a decent income. Something which is especially important for someone like her, being in a 'country which is not yours', always having to take into account that one can be 'thrown out'. She clarifies this by taking her father as an example, who is also a doctor:

> 'I'm from the [Middle-East], I don't know if you know it? My dad always taught me that coming to a country that is not yours, anything could happen. You never know. You can get thrown out. And you have to have something you can rely on, something that's like a safety-blanket. And his career was that safety-blanket for him. […] So I plan to have this, my career as my safety-blanket, because I feel that I'm still like, I'm not a Swedish person, I mean, god knows what happens in 30-50 years, I may get thrown out, maybe a war here, I don't know. But I'll always be a doctor. I always can get a job anywhere'.

Irfan, who also wants to become a doctor, shares the same viewpoint. When he talks about the future, Irfan is quite negative and says that he is worried about the 'growing racism' in Sweden, especially since he expects the economic situation to change:

> 'Because the economy won't be that good in the future. And racism will grow very much, and it's a problem'.

Employability

In search of social and financial security and stability, it is then not surprising that these students prefer fields that score high on employability and income. Naima, for example, says that she is not 'worried about finding a job' at all because:

> 'Dentists they get a job right after they graduate, because, we like…, I have heard, Sweden needs dentists and doctors, people that work on medicine'.

The same idea is also voiced by Irfan, who says that:

> ‘We need a doctor at any time in the future’.

Not all students, however, know what they want to do later. For some, being able to have a job is more important than the type of job. Maryam is one of these students. According to Maryam, in spite of the good economic situation in Sweden, it is still rather hard to find a good job and if you do ‘you are a very lucky person’. These concerns are also expressed in Yaseen’s comment about the fact that these days there are ‘many people who are studying, who have a big education and who are looking for jobs, so it’s very hard’, referring to the increased ‘competition’, both among highly educated as well as less educated people, which makes it overall difficult to find a good job.

Income

For Maryam any type of job is a good job as long as it pays well, or as she puts it:

> ‘The only thing I care is about is how much they will pay me’.

Irfan, similarly emphasizes the importance of income. Being a doctor, he says is one of the best jobs, because ‘you get a lot of money’.

Naima says that although she enjoys writing, she would not consider becoming a writer because ‘she can’t make a living on writing novels’ and because she doesn’t want to be poor in the future:

> ‘I don’t want to be a person who always thinks of her economy, I want to spend my money, like as I want, I don’t want to think: ‘oh, no, don’t buy that or this’.’

For Naima being able to ‘buy anything I want’ equals ‘being happy’.

Significant others

Family plays a fundamental role in modern maximalists' program choice and their career orientations. Naima, for example, says:

> 'I chose the science program because I like the science subjects and because my whole family, when they were my age, also chose this program'.

Naima is referring here to 2 older sisters. One is studying to become a pharmacist and the other is studying to become a dentist.

Najla, who is also considering becoming a dentist, similarly refers to four older siblings; 'Three of them are pharmacists and one is going to be a dentist'.

Rania wants to be a nurse and says that she chose the NS-program because she 'likes science' and because she needs it to become a nurse. Similarly, asked why she wants to become a nurse, Rania refers to her mother and says that both her mother and herself 'like it' as a career choice. Rania adds that she first talked with her older (and only) brother about which program to choose in year 9:

> 'At the beginning I said to my brother, what do you think I should choose, because he was in high school one year before me. So, I said you know better than me, so what do you think I should choose. He said, if you want to continue higher education, choose science, it's better for your future, you can become whatever you want, almost. He also said that it's hard, mathematics, physics and biology, it's hard, but you need to try. So, I choose'.

The importance of choosing an education and career that provide social and financial security, leads the modern maximalist to a choice strategy of 'playing it safe' by choosing a program that will lead to high income careers, for which there is a lot of demand on the future labour market and that have few risks of failure.

4.6.4 Genderedness of ideal types

Each of these ideal types represents the choice processes of a particular group of students. Based on the characteristics of each ideal type we categorized students according to the ideal type they matched most closely. Table 2 presents an overview of the interviewees by ideal type, gender and ethnic background. When we look at the distribution of male and female students within each type, we see that female students are clearly over-represented in type 1, whereas within the second type, the gender balance is in the favour of men. Within the third type the balance is slightly in favour of female, although it is more even than in the other two types. In relation to background, native students are over-represented within the first. This applies even more so to the second type. Students of a non-Western background are over-represented in the third type.

Table 2. Overview of interviewees by ideal type, gender and background (N=36)

Ideal type		*Ethnic background*					
		Western		Non-Western		Total	
	Gender						
Type I - post-modern idealist	male	1	(7%)	0	(0%)	1	(7%)
	female	12	(86%)	1	(7%)	13	(93%)
	sub-total	13	(93%)	1	(7%)	14	(100%)
Type II – postmodern maximalist	male	6	(55%)	2	(18%)	8	(73%)
	female	3	(27%)	0	(0%)	3	(27%)
	sub-total	9	(82%)	2	(18%)	11	(100%)
Type III – modern maximalist	male	2	(18%)	2	(18%)	4	(36%)
	female	1	(9%)	6	(55%)	7	(64%)
	sub-total	3	(27%)	8	(73%)	11	(100%)
Total	male	9	(25%)	4	(11%)	13	(36%)
	female	16	(44%)	7	(19%)	23	(64%)
	Total	25	(69%)	11	(31%)	36	(100%)

4.7 Conclusion and debate

This second study started from the observation that female participation in MST in Sweden is two-and-a-half times higher than in the Netherlands, in spite of similar levels of gender equality and socio-economic development. To understand why relatively more female students in Sweden opt for MST, we focused our study on comparing male and female students' choices for natural science tracks in the two countries. A comparison of the research results of the two case studies provides some unexpected insights, which we will now discuss. The most surprising insight we gained is that male and female students' choice patterns towards natural science tracks actually largely overlap between the Netherlands and Sweden, both in terms of typology and in terms of gender differences (for overview of the types found in each country, see table 3).

Table 3. Ideal types found in the Netherlands and Sweden by key dimensions

Country	The Netherlands			Sweden		
Ideal type	Postmodern perfectionist	Pragmatic hedonist	Material maximalist	Postmodern idealist	Postmodern maximalist	Modern maximalist
Key dimensions						
Orientation	Future orientated	Present orientated	Status and future orientated	Future orientated	Present orientated	Status and future orientated
Choice stress	Constant doubt	Few doubts	Few doubts	-	-	-
Goals	Wants to do something interesting and live up to others' expectations, hence the perfectionist attitude aimed to have it all	Wants to do something and interesting and achieve a high level of income for the least amount of effort	Wants to do something interesting with a high level of social status and income	Wants to do something interesting and meaningful, such as helping others, hence the idealist attitude	Wants to do something interesting and achieve personal success	Wants to do something interesting and with a high level of income and job certainty

Choice strategy	Broad choice in order to avoid 'wrong' choice (i.e. combination profile)	Slightly more narrow choice; has general idea of what to do next and is rather satisfied with that	Broad choice in order to achieve the highest possible outcome	Broad program choice, because it provides the most opportunities for a meaningful and interesting life	Broad program choice because it provides the most opportunities for an interesting and successful life	Broad program choice because it provides the best opportunities for a secure and stable life
External pressure	Sensitive to what significant others think	Less sensitive about what significant others think	Very sensitive to what significant others think, in particularly family, and wants to make parents proud	Sensitive to what others think	Sensitive to what others think	Very sensitive to what significant others think, wants to comply with parents' expectations
Costs	Hard worker, spends a lot of time on homework, eager to obtain high grades	Aims to achieve goals with little as possible effort	Does everything that is required to achieve goals	Eager to obtain high grades, works hard	Eager to obtain good grades in order to be able to continue with interests	Eager to obtain the necessary grades to get into desired fields and careers, works hard now to benefit from it later
Study field preferences	Interested in study fields that fits well with individual personality	Interested in study fields that fit well with individual interests and provide good career perspectives in terms of income	Interested in study fields that lead to high status careers with a lot of job security and guarantee economic prosperity	Interested in fields that match with individual personality traits and have a strong social component	Interested in fields that match individual interests and provide good career perspectives for an interesting and successful life	Interested in fields that provide good career perspectives with a lot material security and certainty

It tells us to be wary about the assumed effects of economic development and postmaterialist values, as they clearly do not translate in one singular choice pattern. Secondly, the results also suggest that the choice for natural science tracks is to a large extent institutionally driven. Students in both countries perceive these tracks as the 'best' choice, because they create most opportunities in terms of access to future study fields and careers. Thus, this institutional advantage that is currently attached to natural science in various educational contexts, including the Dutch and Swedish, appears to be a primary reason for choosing natural science tracks, which are not linked directly to an interest *per se* in MST fields and careers. Furthermore, when we look beyond this institutional incentive to choose the 'best' track, and focus on students' intrinsic motivation, a basic assumption behind Sjøberg and Schreiner's theory about gendered study choice is clearly supported. Based on their theory, we expected female students to feel less positive about choosing natural science tracks than male students, and the interviews in both countries clearly reflect this. In accordance with the genderedness of the ideal types, we find that the majority of postmodern perfectionist and postmodern idealist, the female students in particular, are not very motivated to choose a MST field, and this is even true for those female students who have opted for the tracks that seem to lead to those studies. In practice, even these female students show a strong preference in fields and careers related to medicine. Thus, female students' choices in favour of the natural science tracks in both countries are predominantly extrinsically motivated and do not reflect their inner motivations.

In line with Schreiner and Sjøberg's educational modernization theory, we further expected and indeed found that students with a non-Western background are driven to a larger extent by material considerations[7] of wealth and job security. This is indeed what we find in both countries in the form of the third ideal type, which applies more often to non-Western students. Compared to the effect of gender, however, this factor seems to have a more limited effect. The likely explanation for this is that at least some of these migrant students' study choices are influenced by the postmaterial value orientations of their peers.

Having said this, the final conclusion of this paper has to be, however, that our findings have made the differences in gendered study choice between the Netherlands and Sweden even more paradoxical. We now know that these countries are very similar, not only in terms of gender equality and in economic development, but also in the genderedness of intrinsic study motivation in upper secondary education. Yet, the actual study choices in Sweden are still much less gendered than in the Netherlands.

4.7.1 Implications for future research

Our comparative study of Sweden and the Netherlands thus leaves us with a puzzling question: Why do significantly more female students in Sweden opt for MST studies in higher education if Dutch and Swedish girls think very similarly about natural science tracks in high school?

As we have found that there is much similarity between both countries at the individual-level, considering the similarity in the genderedness of the ideal types found in each country, we suggest that an answer to this questions may be found in the differences in the institutional contexts the two countries offer, or in the interaction between institutional and cultural contexts. For example, the Dutch and Swedish economy is both considered to be highly developed, post-industrial economies, but are differently organised. The Dutch economy, for example, has a relatively large service sector, whereas the Swedish economy is more orientated towards the production of goods such as timber, hydropower and iron ore (European Commission, 2016; De Nederlandsche Bank, 2014). It is not unlikely that such differences can lead to a different balancing between intrinsic and extrinsic motivations at the moment a choice for or against an MST study really has to be made.

Finally, while the starting point for our study was the large difference in female participation in MST fields between Sweden and the Netherlands, the qualitative analysis of students' choice process towards natural science tracks, in particular the typologies found in each country, have shown strong similarities between Swedish and Dutch girls' assessments of natural science

tracks, and MST careers. Postmodern perfectionists in the Dutch study, who are largely comprised of girls, do not choose a natural science track out of intrinsic motivation or interest in scientific careers. Nor do the postmodern idealist in the Swedish study, who is also mostly comprised of girls. While they both do opt for natural science tracks, they do so for fundamentally different reasons. Swedish girls, do so because they link natural science with ideals of a better world, as well as having better job prospects, whereas most Dutch girls think of it in a more negative way, and opt for it just to make sure that they don't make the wrong choice later on when they have to opt for a study field. The typologies found in this study therefore also bear important policy implications for addressing the issue of gender inequality in MST fields. The large overlap in typologies found the Netherlands and Sweden suggests that policies to increase female enrolment in MST fields should not only focus on girls' motivations, e.g. by attempting to make MST more attractive for girls, as Swedish girls, despite their lack of intrinsic motivation opt two-and-a-half times more often than Dutch girls for MST fields in higher education. The choice for MST fields is obviously not explained by intrinsic motivation alone. To attract more female students in MST fields, policy makers should take into account other factors as well in promoting female enrolment in MST fields.

Endnotes

1. Participation in 'MST fields' and 'MST' refers to the share of female students at ISCED levels 5-6 enrolled in the fields of science, mathematics, computing, engineering, manufacturing and construction as a percentage of all female students (Eurostat, 2012b). The levels and fields of education and training used, follow the 1997 version of the International Standard Classification of Education (UNESCO, 2006 [1997]) and the Eurostat manual of fields of education and training (Andersson & Olsson, 1999).
2. According to the most recent Gender Inequality Index, Sweden and the Netherlands rank 12th and 4th of 187 countries in gender equality (United Nations, 2014a). Similarly, according to the most recent Global Gender Gap Index, Sweden and the Netherlands rank 4th and 14th of 142 countries in gender equality (World Economic Forum, 2014).
3. The GDP per capita PPP is 41.840 USD in Sweden and 42.453 USD in the Netherlands (United Nations, 2014b).
4. The annual harmonized unemployment rate is 7.9% in Sweden and 7.4% in the Netherlands (OECD, 2015b).
5. The average life expectancy at birth is 81.8 years in Sweden and 81 years in the Netherlands (United Nations, 2014c).
6. According to the most recent Human Development Index, Sweden and the Netherlands rank 12th and 4th of 187 countries in human development (United Nations, 2014d).
7. The non-Western students in the Netherlands more often have a labour migrant background, while the families of their Swedish counterparts more often came as refugees (Bevelander and Irastorza, 2014; Sanderse, Verweij and de Beer, 2011). We expected this might influence their study choices – e.g. one would expect among the children of labour migrants, who came to improve their living conditions, stronger materialistic motivations for choice, like high income and high status, than among children of refugees. We found, however, no important differences between the two groups and therefore did not further pursue this issue.
8. Schreiner and Sjøberg use the terms 'Western', 'developed', 'modern', 'modernized' and 'late-modern' as synonyms in reference to cultural, economic and political development in Western societies.
9. It is for this reason that attention is also given to differences in students' ethnic background in this comparative case study of male and female student's choices for or against natural science tracks (assuming that students with a migrant background will differ in their cultural values and gender role expectations).
10. For a more elaborate description of the Swedish secondary school system, see Eurydice, 2013.

11. In this study we apply the same definition as in the Dutch case to distinguish between students with a native Swedish, a Western and a non-Western migrant background (Yazilitas et al., 2016).
12. The typology approach is for this reason of course limited in scope. Its strength lies in its ability to describe social phenomena on specific dimensions and to categorize cases that share the same dimensions without providing an in-depth analysis for each case.

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